

IN THE CLAIMS

Please amend the claims as follows:

Claims 1-22 (Canceled).

Claim 23 (New): A high-frequency package comprising:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor; and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region.

Claim 24 (New): The high-frequency package according to claim 23, wherein the resistance film is provided at a portion near the first signal via.

Claim 25 (New): The high-frequency package according to claim 23, wherein the resistance film is provided at portion near the second signal via.

Claim 26 (New): The high-frequency package according to claim 23, wherein the multilayer dielectric substrate further includes:

- a cavity having a bottom surface, and configured to accommodate the high-frequency semiconductor therein;

- a ground conductor formed on the bottom surface of the cavity; and

- a conductor pad configured to be connected to the bias-and-control-signal terminal; and

the first signal via is configured to be connected to the conductor pad with a wire, and the external terminal is configured to be connected to an external substrate with a wire.

Claim 27 (New): The high-frequency package according to claim 23, wherein a distance between adjacent ground vias is less than approximately a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor.

Claim 28 (New): A high-frequency package comprising:

- a high-frequency semiconductor including a bias-and-control-signal terminal;

- a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor; and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein

a slot line having a length approximately a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line.

Claim 29 (New): The high-frequency package according to claim 28, wherein the multilayer dielectric substrate includes a conductor pad formed on the surface layer,

the first signal via is configured to be connected to the conductor pad, and

the surface-layer ground conductor is configured to surround, at least partially, the conductor pad through an area at which a dielectric material is exposed.

Claim 30 (New): A high-frequency package comprising:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor; and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region, wherein

a low-pass filter configured to suppress passage of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line.

Claim 31 (New): A high-frequency package comprising:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and

a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength.

Claim 32 (New): The high-frequency package according to claim 31, wherein the second ground via string is arranged under a portion at which the electromagnetic shielding member contacts the multilayer dielectric substrate.

Claim 33 (New): A high-frequency package comprising:

- a high-frequency semiconductor including a bias-and-control-signal terminal;
- a multilayer dielectric substrate including:
 - a cavity having a bottom surface and a sidewall that is configured to be non-grounded;
 - a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor;
 - at least one first signal via configured to be connected to the bias-and-control-signal terminal;
 - at least one second signal via configured to be connected to an external terminal for a bias and control signal;
 - at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and
 - at least one internal-layer signal line configured to connect between the first signal via and the second signal via;
 - a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via and close to the sidewall, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and

a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength.

Claim 34 (New): The high-frequency package according to claim 33, wherein
a part of each of the ground vias in the first ground via string is exposed to the sidewall.

Claim 35 (New): The high-frequency package according to claim 33, wherein
an area in which a dielectric material is exposed is formed at a portion on the surface of the multilayer dielectric substrate, the portion between the electromagnetic shielding member and the sidewall.

Claim 36 (New): A high-frequency package comprising:
a high-frequency semiconductor including a bias-and-control-signal terminal;
a multilayer dielectric substrate including:
a cavity having a bottom surface;
a surface-layer ground conductor arranged on the bottom surface and
configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a sidewall ground pattern formed on a sidewall of the cavity; and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall ground pattern and the ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength.

Claim 37 (New): The high-frequency package according to claim 36, wherein an area in which a dielectric material is exposed is formed at a portion on the surface of the multilayer dielectric substrate, the portion between the electromagnetic shielding member and the sidewall.

Claim 38 (New): A high-frequency package comprising:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor; and

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via; and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall and the ground via string is less than a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength.

Claim 39 (New): The high-frequency package according to claim 38, wherein

an area in which a dielectric material is exposed is formed at a portion on the surface of the multilayer dielectric substrate, the portion between the electromagnetic shielding member and the sidewall.

Claim 40 (New): A high-frequency package comprising:

- a high-frequency semiconductor including a ground terminal and a bias-and-control-signal terminal on a rear surface thereof;
- a plurality of conductor pads configured to mount the high-frequency semiconductor by flip-chip bonding;
- a multilayer dielectric substrate including:
 - a plurality of signal vias configured to be connected to the bias-and-control-signal terminal;
 - at least one internal-layer signal line configured to connect between the signal vias; and
 - a plurality of ground via string configured to be connected to the internal-layer ground conductor and to surround the signal vias;
 - at least one internal-layer ground conductor configured to be connected to the ground terminal; and
 - an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein
 - a distance between the ground via strings sandwiching the signal vias is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor.

Claim 41 (New): A transmission/reception module comprising:

- a high-frequency package including:
 - a high-frequency semiconductor including a bias-and-control-signal terminal;
 - a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line configured to connect between the first signal via and the second signal via;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor;

and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor;

and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 42 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor;
and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein

a slot line having a length approximately a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 43 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor;
and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region, wherein

a low-pass filter configured to suppress passage of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor;
and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 44 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and

a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 45 (New): A transmission/reception module comprising:

- a high-frequency package including:
 - a high-frequency semiconductor including a bias-and-control-signal terminal;
 - a multilayer dielectric substrate including:
 - a cavity having a bottom surface and a sidewall that is configured to be non-grounded;
 - a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor;
 - at least one first signal via configured to be connected to the bias-and-control-signal terminal;
 - at least one second signal via configured to be connected to an external terminal for a bias and control signal;
 - at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and
 - at least one internal-layer signal line configured to connect between the first signal via and the second signal via;
 - a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via and close to the sidewall, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and
 - a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 46 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a sidewall ground pattern formed on a sidewall of the cavity; and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall ground pattern and the ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 47 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor; and

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via; and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall and the ground via string is less than a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 48 (New): A transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a ground terminal and a bias-and-control-signal terminal on a rear surface thereof;

a plurality of conductor pads configured to mount the high-frequency semiconductor by flip-chip bonding;

a multilayer dielectric substrate including:

- a plurality of signal vias configured to be connected to the bias-and-control-signal terminal;
- at least one internal-layer signal line configured to connect between the signal vias; and
- a plurality of ground via string configured to be connected to the internal-layer ground conductor and to surround the signal vias;
- at least one internal-layer ground conductor configured to be connected to the ground terminal; and
- an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein

- a distance between the ground via strings sandwiching the signal vias is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor;
- a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor;
- and
- an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor.

Claim 49 (New): A radar device comprising:

- a transmission/reception module including:
 - a high-frequency package comprising:
 - a high-frequency semiconductor including a bias-and-control-signal terminal;
 - a multilayer dielectric substrate including:
 - a surface-layer ground conductor configured to mount the high-frequency semiconductor;
 - at least one first signal via configured to be connected to the bias-and-control-signal terminal;
 - at least one second signal via configured to be connected to an external terminal for a bias and control signal;
 - at least one internal-layer signal line configured to connect between the first signal via and the second signal via;
 - at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;
 - a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor;
 - and
 - at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and
 - an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 50 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor; and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein

a slot line having a length approximately a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 51 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

at least one internal-layer ground conductor arranged around the first signal via, the second signal via, and the internal-layer signal line;

a plurality of ground vias arranged around the first signal via, the second signal via, and the internal-layer signal line, on the internal-layer ground conductor; and

at least one resistance film arranged on at least one of an upper surface and a lower surface of at least one of the internal-layer signal lines; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein the electromagnetic shielding member covers a region that includes the first signal via, and the second signal via is arranged outside of the region, wherein

a low-pass filter configured to suppress passage of a high-frequency signal used in the high-frequency semiconductor is provided on the internal-layer signal line;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 52 (New): A radio device comprising:

a transmission/reception module comprising:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a surface-layer ground conductor configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal configured to connect between the first signal via and the second signal via;

a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and

a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 53 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface and a sidewall that is configured to be non-grounded;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a first ground via string arranged at a portion closer to the high-frequency semiconductor than the first signal via and close to the sidewall, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor; and

a second ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the first ground via string and the second ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the first ground via string and the second ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 54 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor; and

at least one internal-layer signal line configured to connect between the first signal via and the second signal via;

a sidewall ground pattern formed on a sidewall of the cavity;
and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall ground pattern and the ground via string is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 55 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a bias-and-control-signal terminal;

a multilayer dielectric substrate including:

a cavity having a bottom surface;

a surface-layer ground conductor arranged on the bottom surface and configured to mount the high-frequency semiconductor; and

at least one internal-layer ground conductor configured to be connected to the surface-layer ground conductor;

at least one first signal via configured to be connected to the bias-and-control-signal terminal;

at least one second signal via configured to be connected to an external terminal for a bias and control signal;

at least one internal-layer signal line configured to connect between the first signal via and the second signal via; and

a ground via string arranged between the first signal via and the second signal via, and including a plurality of ground vias configured to be connected to the internal-layer ground conductor, wherein

a distance between the sidewall and the ground via string is less than a quarter of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor, and

a distance between adjacent ground vias in the ground via string is less than a half of the effective wavelength;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

- an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;
- an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;
- an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and
- a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.

Claim 56 (New): A radio device comprising:

a transmission/reception module including:

a high-frequency package including:

a high-frequency semiconductor including a ground terminal and a bias-and-control-signal terminal on a rear surface thereof;

a plurality of conductor pads configured to mount the high-frequency semiconductor;

a multilayer dielectric substrate including:

a plurality of signal vias configured to be connected to the bias-and-control-signal terminal;

at least one internal-layer signal line configured to connect between the signal vias; and

a plurality of ground via string configured to be connected to the internal-layer ground conductor and to surround the signal vias;

at least one internal-layer ground conductor configured to be connected to the ground terminal; and

an electromagnetic shielding member configured to cover at least a part of the high-frequency semiconductor, wherein

a distance between the ground via strings sandwiching the signal vias is less than a half of an effective wavelength of a high-frequency signal used in the high-frequency semiconductor;

a waveguide terminal configured to input and output a transmission wave and a reception wave between the high-frequency package and the high-frequency semiconductor; and

an external substrate configured to supply a bias signal to the high-frequency semiconductor, to exchange a control signal with the high-frequency semiconductor, and to control to modulate a transmission wave output from the high-frequency semiconductor;

an antenna configured to transmit and receive high-frequency signals that are input and output via the waveguide terminal;

an electronic circuit configured to convert an output from the reception system circuit into a low-frequency signal; and

a signal processing substrate configured to calculate a distance and a relative speed with respect to a target based on the low-frequency signal.